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Report on

Incident Light Microscopic
Studies of Devonian Shale

by

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Twenty shale samples were studied using reflected light microscope to determine the reflectivity of dispersed vitrinite and organic-inorganic association of the shale. The samples range in depth from 2748 ft. to 40068 ft. below surface. The mean maximum reflectance of dispersed vitrinite range from 0.56% to 0.78% with a dispersion of 0.22%. The measured values are given in Table 1 and Figure 1. A quick glimpse of Figure 1 reveals that there are apparently two distinctive population of dispersed vitrinite exhibiting a high and a low reflectance values. The high reflectance value always associate with light gray to gray shales whereas low reflectance values are closely associated with dark organic rich shales.

The organic rich shales are characterized by abundant amorphous, fluorescent organic material as well as non-fluorescent vitrinites. They are also rich in fine grained and framboidal pyrite. On the other hand the light colored shales are usually low in organic material, and coarser in grain size in both inorganic and organic fractions.

The reflectance of all samples as a whole shows no systematic change with depth. But if one disregard the low readings (samples 7, 11, 12, 13, 14, 18, and 20), the reflectance of the remaining samples changes according to the following regression equation:

$$X = 4.156 \times 10^{-5} + 0.574 \times Y \quad \text{-----}(1)$$

Thus the reflectance increases with depth at a rate of 0.004%/100 ft. (0.13%/100 meter).

Table 1. Reflectance of dispersed vitrinite from cored Devonian Shale in Lincoln County, West Virginia.

<u>Sample No.</u>	<u>Sample Depth</u>	<u>Number of Readings</u>	<u>Mean Ro%</u>	<u>Range of Ro</u>
1.	2748	25	0.69	0.46-0.92
2.	2814.9	10	0.64	0.47-0.84
3.	2896.5	33	0.72	0.51-0.94
4.	2968	37	0.68	0.50-0.94
5.	2993.5	15	0.68	0.45-0.88
6.	3083.4	17	0.68	0.48-0.92
7.	3168.1	32	0.59	0.45-0.90
8.	3262	16	0.76	0.57-0.91
9.	3340	27	0.74	0.52-0.93
10.	3400	56	0.78	0.48-0.94
11.	3454	54	0.64	0.45-0.91
12.	3504	61	0.63	0.45-0.85
13.	3549	54	0.65	0.49-0.83
14.	3589	54	0.65	0.49-0.89
15.	3640	57	0.71	0.53-0.89
16.	3724.5	20	0.73	0.58-0.85
17.	3797.9	60	0.72	0.59-0.92
18.	3871.6	12	0.60	0.47-0.68
19.	3947	38	0.70	0.48-0.94
20.	4006.9	47	0.56	0.45-0.90

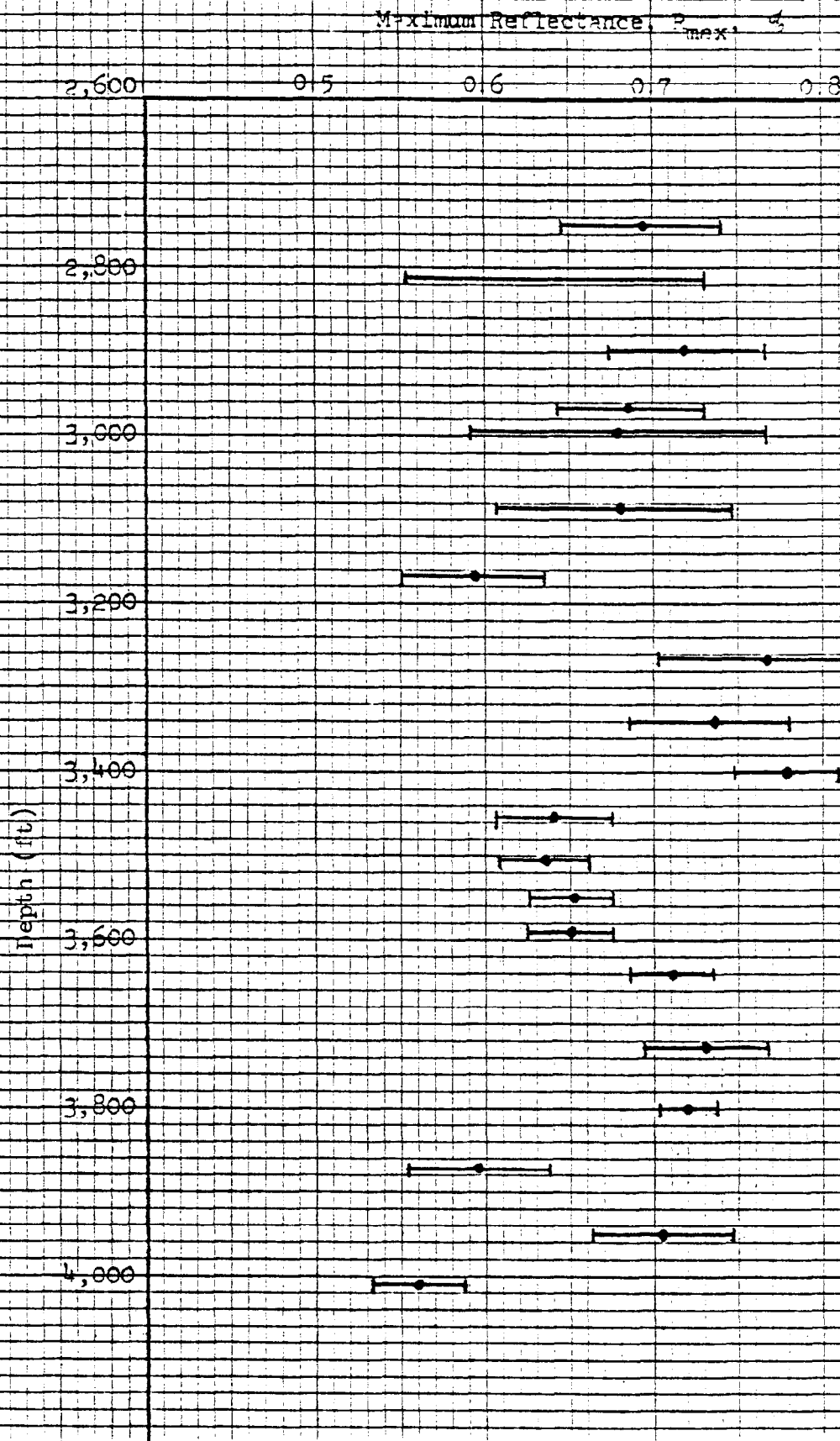


Figure 1. Maximum reflectance, R_{max} , of dispersed vitrinite plotted against depth of sample, Lincoln 20403.

Figure 2. (A) Photomicrograph of typical dispersed vitrinite (v) embedded in a light colored shaly matrix. Note the low concentration of pyrite (P), 380x, (B) A large piece vitrinite containing numerous micrinite (light spcks) and exhibiting orthogonal fractures, 380x, (C) Dispersed vitrinite (v) embedded in dark colored shale containing abundant amorphous organic material. A microspore occurs just below the vitrinite particle. Note the relative large quantity of pyrite (as compared to Fig. 2A), 380x, (D) Same as Figure 2C, blue light fluorescence. Spores and amorphous organic material (amorphous kerogen) exhibit strong fluorescence whereas vitrinite and pyrite are nonfluorescing, 380x.